CLAIMS

We claim:

1. A microfluidic device comprising one or more microfluidic vessel(s), wherein each of said microfluidic vessel(s) comprise walls and at least one flow guide contained therein, for controlling the flow of liquids within said microfluidic vessel(s).

2. The microfluidic device of Claim 1, wherein said at least one flow guide comprises a holding flow guide that extends toward but does not contact a distal wall of said microfluidic vessel(s), and wherein said controlling comprises delaying the flow of a liquid toward said distal wall.

3. The microfluidic device of Claim 2, wherein said at least one flow guide further comprises a releasing flow guide that extends toward and contacts a distal wall of said microfluidic vessel(s), and wherein said controlling comprises hastening the flow of a liquid toward said distal wall.

4. The microfluidic device of Claim 2, wherein said at least one flow guide comprises an area within said microfluidic vessel(s) having reduced capillarity.

5. The microfluidic device of Claim 2, wherein said at least one flow guide comprises areas within said microfluidic vessel(s) having enhanced capillarity.

6. The microfluidic device of Claim 2, wherein said at least one flow guide comprises areas within said microfluidic vessel(s) having reduced capillarity, and an area within said microfluidic vessel(s) having enhanced capillarity.

7. The microfluidic device of Claim 2, wherein said at least one flow guide is a structural flow guide.

8. The microfluidic device of Claim 2, wherein said at least one flow guide is a surface flow guide.

9. The microfluidic device of Claim 8, wherein said surface flow guide comprises a hydrophobic material deposited within said microfluidic vessel(s).

10. The microfluidic device of Claim 9, wherein said hydrophobic material comprises trichlorosilane, and said microfluidic vessel(s) comprises a glass substrate.

11. The microfluidic device of Claim 2, wherein said flow guide is a hybrid structural/surface flow guide.

12. A microfluidic system comprising the microfluidic device of Claim 2, and a thermal cycling component.

13. The microfluidic system of Claim 12, further comprising a capillary electrophoresis component and at least three electrodes.

14. The microfluidic system of Claim 12, further comprising a detection component.

15. An automated loading system, comprising:

a stationary loading station comprising a sample-loading capillary tube, a reagent-loading capillary tube, and a guillotine for cleaving used portions of said tubes; and

a movable programmable stage for positioning the microfluidic device of Claim 3, and a sample tray in juxtaposition to said tubes, for dispensing a sample onto said holding flow guide and for dispensing reagents onto said releasing flow guide of said microfluidic vessel(s).

16. The automated loading system of Claim 15, wherein said movable programmable stage is configured to move both horizontally and vertically.

17. A method for loading and/or unloading a microfluidic device for minimizing reagent or sample contamination, comprising:

a) providing a microfluidic device comprising one or more microfluidic vessel(s), wherein said microfluidic vessel(s) comprise walls with two or more ports, a holding flow guide and a releasing flow guide, wherein said two or more ports comprise a sample port and a reagent port, and wherein said releasing flow guide extends toward and contacts a distal wall of said microfluidic vessel(s), while said holding flow guide extends toward but does not contact a distal wall of said microfluidic vessel(s);

b) dispensing a sample through said sample port onto said holding flow guide; and

c) dispensing a reagent through said reagent port onto said releasing flow guide.

18. The method of Claim 17, wherein said sample comprises a smaller volume than does said reagent.

19. The method of Claim 17, wherein said two or more ports further comprise a venting or sampling port, and wherein said method further comprises releasing any air contained within said microfluidic vessel(s).

20. The method of Claim 17, wherein said two or more ports further comprise a venting or sampling port, and wherein said method further comprises removing a portion of the liquid contained with said microfluidic vessel(s).